

Accuracy Characteristics for ZTL Risk Reduction Scenario Hours 1700-2000

1 Introduction

This document contains scenario characteristics for hours 1700 to 2000 GMT recorded on October 11, 2000 at Atlanta ARTCC (ZTL). Characteristics to be provided are general statistics determined from the scenario on airspace characteristics, aircraft to aircraft and aircraft to airspace encounters, general air traffic, aircraft, and flight plan adherence. Definitions of the provided scenario characteristics are provided in Reference[1].

2 Reference

[1] Paglione,M., Oaks,R., Ryan,Dr. H., Summerill,J.S., (Final, January 2000), *Description of Accuracy Scenarios for the Acceptance Testing of the User Request Evaluation Tool (URET) / Core Capability Limited Deployment (CCLD)*, FAA William J. Hughes Technical Center / ACT-250, Atlantic City, New Jersey.

NOTE – Section numbers in this document do not map to those of the reference document.

3 Center Airspace

This section corresponds to Section 3.1 of Reference[1]. The below data corresponds to the ZTL Center using the October 11, 2000 ACES chart cycle. Information provided in Table 1 was gathered from running URET PRE and local knowledge.

Table 1: Center Airspace Characteristics

Metric	Definitions	Count
Airports	From URET DU Adaptation List	TBD
Sectors	From URET DU Adaptation List	TBD
SAA	Special Activities Airspace	TBD
APDIA	Automated Problem Detection Inhibited Area	TBD
SID	Standard Instrument Departure	TBD
STAR	Standard Arrival Route	TBD
PAR	Preferential Arrival Route	TBD
PDR	Preferential Departure Route	TBD
PDAR	Preferential Departure Arrival Route	TBD

4 Aircraft Encounter Distributions

The statistics collected in this section characterize aircraft to aircraft encounters. The encounter counts are partitioned by selected minimum horizontal separation intervals, a count of encounters partitioned by standard flight levels, and by vertical phase of flight and aircraft encounter angle. This section corresponds to Section 3.2.1 in Reference[1].

4.1 Count Partitioned by Minimum Horizontal Separation

This section corresponds to Section 3.2.1.1 in Reference[1].

Table 2: Count of Current Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	13 Minutes Adherence
$0 \leq d < 5$	143	76
$5 \leq d < 10$	206	92
$10 \leq d < 15$	255	136
$15 \leq d < 23$	550	274
$23 \leq d < 30$	514	239
Total	1668	817

Table 3: Count of Trial Plan Aircraft Encounters

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
$0 \leq d < 5$	143	75
$5 \leq d < 10$	206	86
$10 \leq d < 15$	255	124
$15 \leq d < 24$	638	285
$24 \leq d < 30$	426	181
Total	1668	751

4.2 Count Partitioned by Altitude for Standard Separation Intervals

This section corresponds to Section 3.2.1.2 of Reference[1].

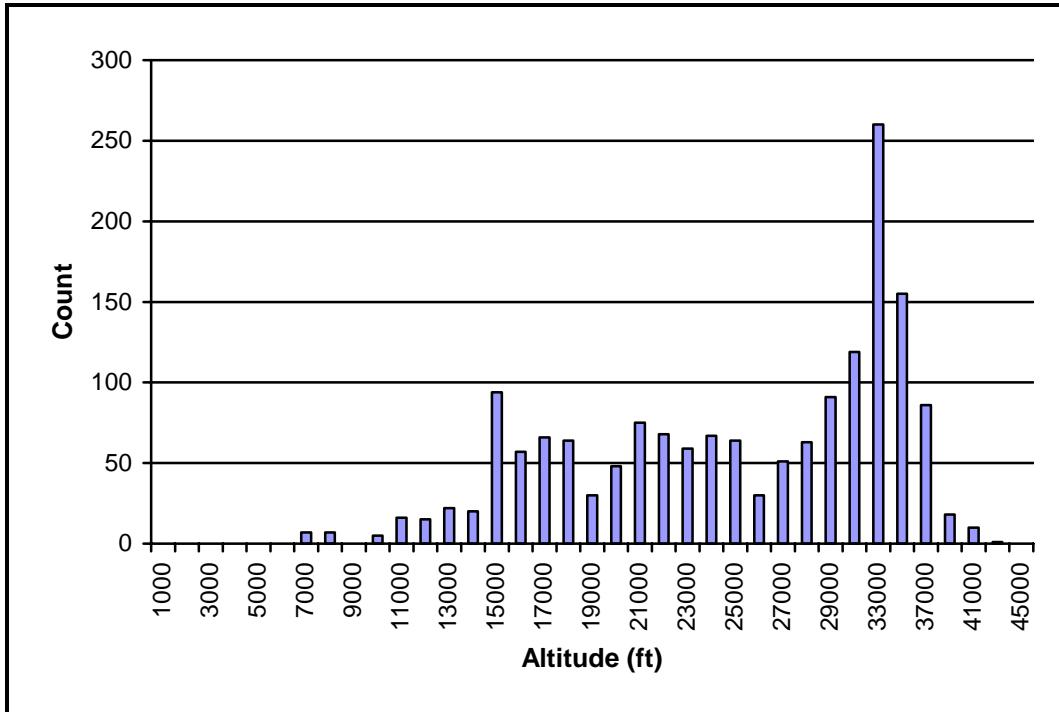


Figure 1: Aircraft to Aircraft Encounters by Altitude

4.3 Count Partitioned by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.1.3 of Reference[1].

Table 4: Count of Aircraft Encounters Partitioned by Phase of Flight and Encounter Angle

Vertical Phase	Encounter Angles (deg)				Total
	[0, 45)	[45, 90)	[90, 135)	[135, 180]	
Cruise-Cruise	47	40	34	25	146
Descend-Descend	95	15	11	11	132
Climb-Climb	120	24	15	19	178
Cruise-Climb	168	103	93	146	510
Cruise-Descend	158	79	72	103	412
Climb-Descend	70	62	24	107	263
Unknown	19	3	1	4	27
Total	677	326	250	415	1668

5 Airspace Encounter Distributions

This section provides statistics on aircraft to airspace encounters. Three areas considered are counts partitioned by selected minimum horizontal separation intervals, an encounter count partitioned by standard flight levels, and a count partitioned by vertical phase of flight and airspace encounter angle. Additionally, vertical phase of flight count is separated into top, bottom and side airspace encounters and for encounters with unknown encounter angles. The section corresponds to Section 3.2.2 of Reference[1].

5.1 Count Partitioned by Minimum Horizontal Separation

The section corresponds to Section 3.2.2.1 of Reference[1].

Table 5: Count of Current Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	13 minutes Adherence
Conflicts ¹	45	30
$d = 0^2$	51	40
$0 < d < 7$	183	140
$7 \leq d < 9$	35	25
$9 \leq d < 11$	43	30
$11 \leq d < 16$	105	90
$16 \leq d < 30$	448	343
Total	910	698

Table 6: Count of Trial Plan Airspace Encounters by Horizontal Separation

Min. Horz. Separation (nm)	Without Adherence	20 minutes Adherence
Conflicts ³	45	30
$d = 0^4$	51	39
$0 < d < 8$	200	157
$8 \leq d < 11$	61	43
$11 \leq d < 13$	47	39
$13 \leq d < 19$	155	125
$19 \leq d < 30$	351	263
Total	910	696

¹ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

² This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

³ This count includes encounters that are conflicts. By definition the minimum horizontal separation is zero and the track point actually penetrates the airspace.

⁴ This count includes encounters without valid airspace penetrations, which occurs under two cases: a short duration penetration or an encounter on the actual buffered boundary of the airspace which does not penetrate.

5.2 Count Partitioned by Altitude

This section corresponds to Section 3.2.2.2 of Reference[1].

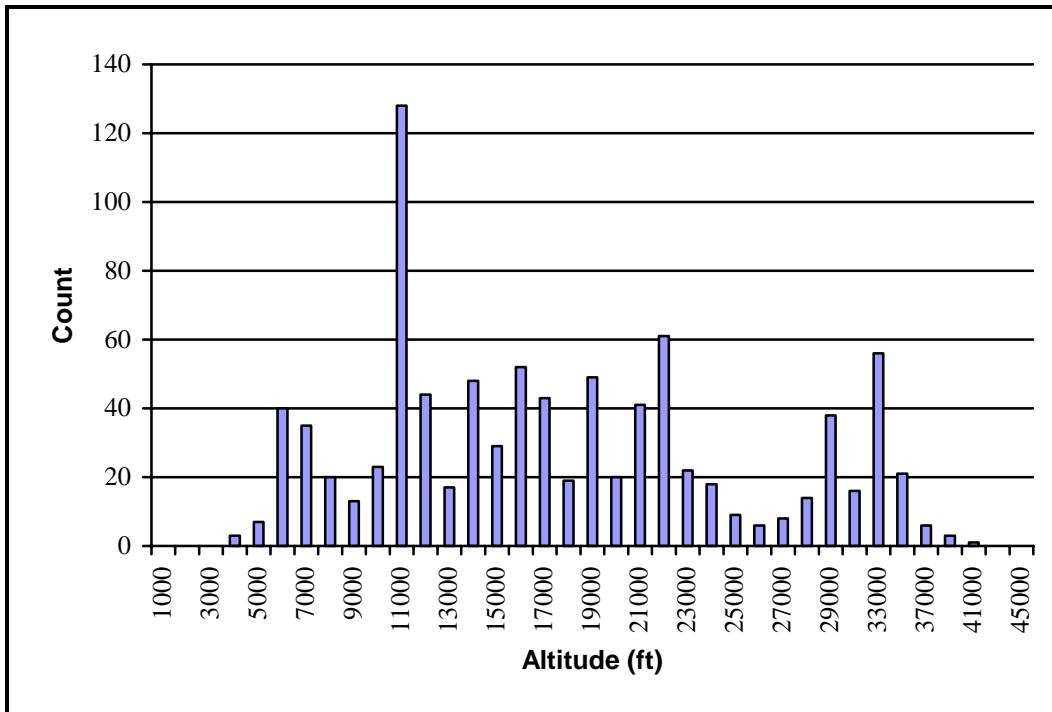


Figure 2: Airspace to Airspace Encounters by Altitude

5.3 Count by Vertical Phase of Flight and Encounter Angle

This section corresponds to Section 3.2.2.3 in Reference[1].

Table 7: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Side Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	0	3	1	4
Cruise	2	5	7	14
Descend	0	2	4	6
Total	2	10	12	24

Table 8: Count of Airspace Encounters by Angle and Vertical Phase of Flight for Top and Bottom Conflicts

Vertical Phase	Encounter Angles (deg)			Total
	[0, 30)	[30, 60)	[60, 90)	
Climb	4	0	0	4
Cruise	0	0	0	0
Descend	3	0	0	3
Total	7	0	0	7

Table 9: Count of Airspace Encounters by Vertical Phase of Flight with Unknown Angles

Vertical Phase	Count
Climb	10
Cruise	4
Descend	0
Total	14

6 Air Traffic Distributions

This section provides metrics that characterize the air traffic. The metrics are flight density partitioned by standard flight levels, flight type and sector penetration, statistics on the number of active flights, ground speed statistics, counts of interim altitude and amendment messages, and air traffic maneuvers by altitude and phase of flight. This section corresponds to Section 3.3 of Reference[1].

6.1 Air Traffic Density

This section corresponds to section 3.3.1 of Reference[1]. Detailed statistics on aircraft encounters are provided in Appendix A.

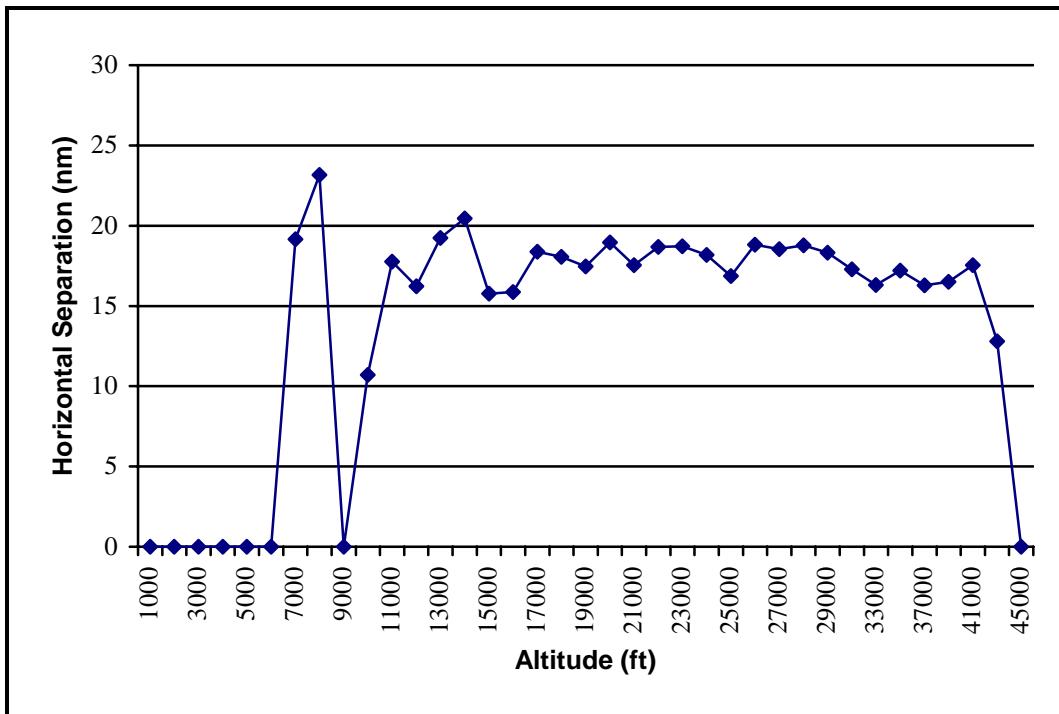


Figure 3: Average Horizontal Separation by Altitude for All Hours

6.2 Active Flights

This section corresponds to section 3.3.2 of Reference[1].

Table 10: Statistics on Active Flights per Minute Increment

Count Average	Standard Deviation	Maximum Count	Minimum Count
124.628	163.841	451	0

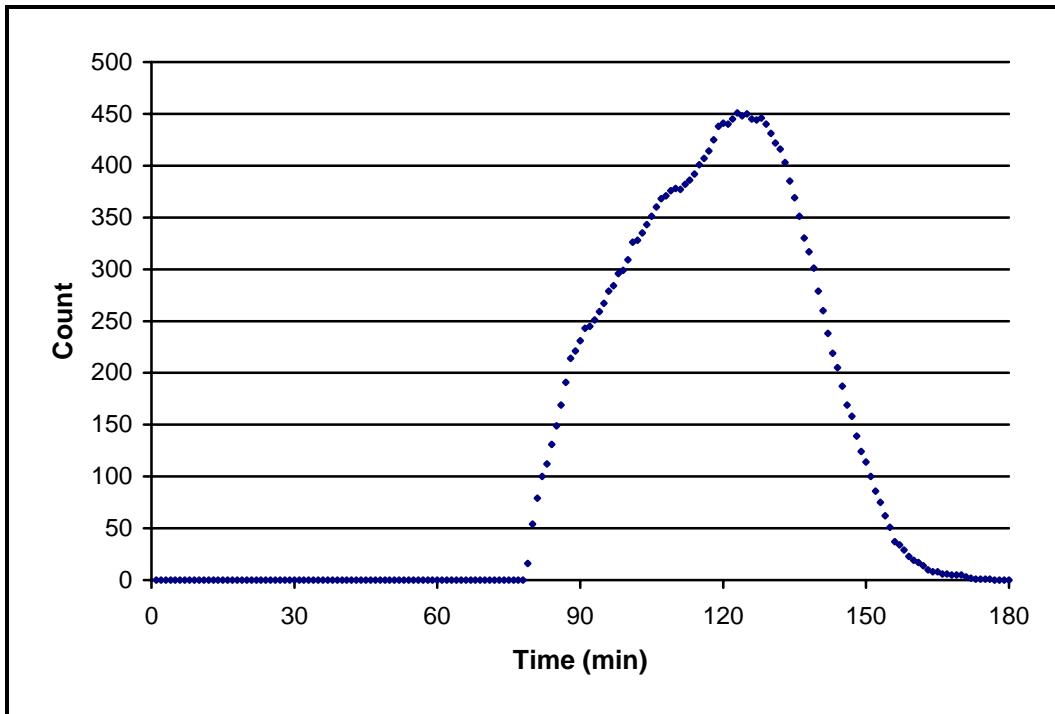


Figure 4: Count of Active Flights per Minute Increment

6.3 Flight Type and Sector Penetration

This section corresponds to Section 3.3.3 of Reference[1].

Table 11: Statistics on Sector Time, Center Time and Sector Penetration by Flight Type

Metric	Arrivals	Departures	Internals	Overflights	All Flights
Average Number of Sectors Penetrated	2.302	2.333	2.206	2.513	2.272
Average Time in Center (sec)	1091.111	1139.343	1095.947	1396.923	1119.117
Average Time in Sector (sec)	465.586	476.320	489.483	542.551	483.561
Percentage by Flight Type	22.554	23.628	49.165	4.654	100.000

6.4 Ground Speed

This section corresponds to Section 3.3.4 of Reference[1]. Detailed statistics on aircraft ground speed are provided in Appendix B.

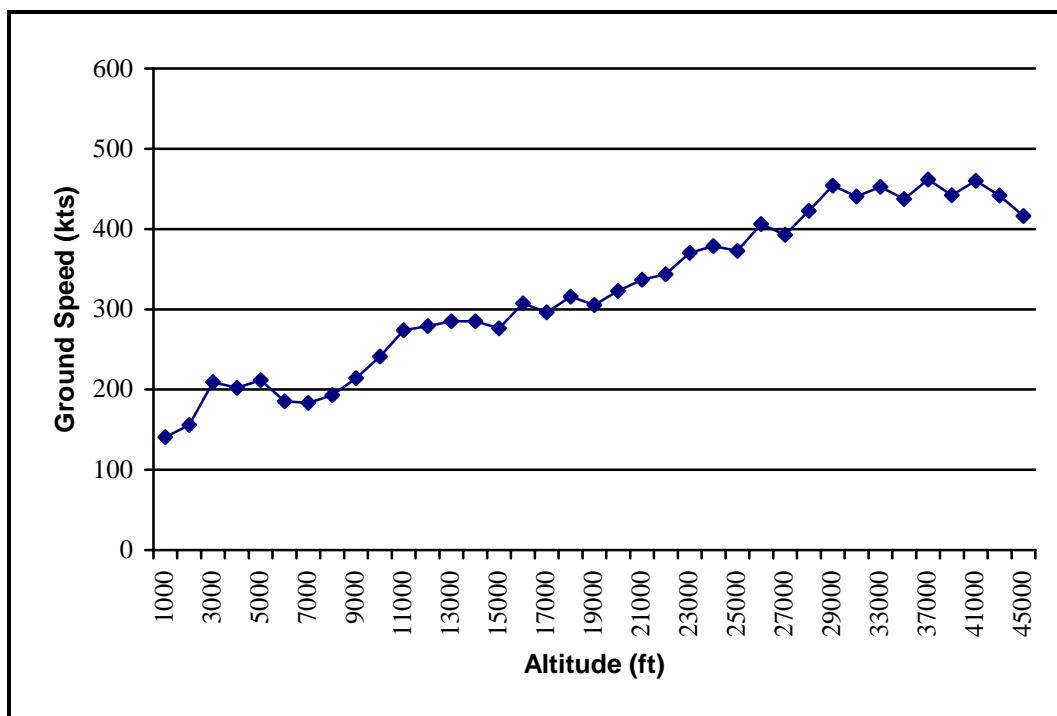


Figure 5: Average Ground Speed by Altitude for All Hours

6.5 Center to APD Ratio

This section corresponds to Section 3.3.5 of Reference[1].

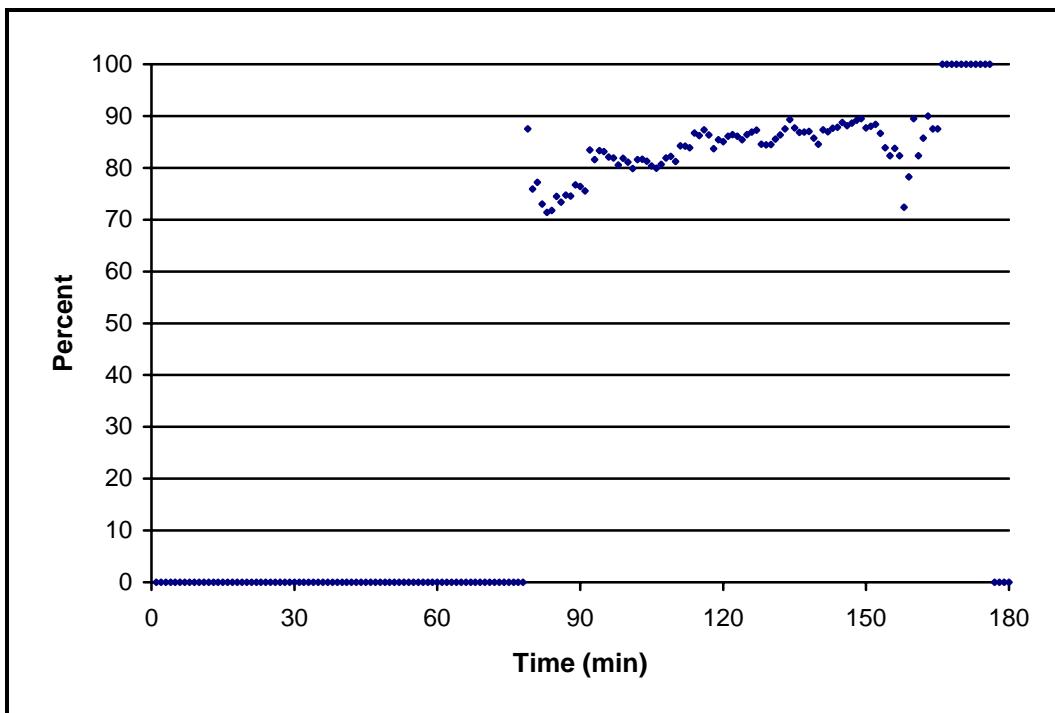


Figure 6: Percentage of Track Points in Center to APD Zone per Minute Increment

6.6 Interim Altitude Messages

This section corresponds to Section 3.3.6 of Reference[1].

Table 12: Statistics on Interim Altitude Messages⁵

Flight Count	Average	Standard Deviation	Maximum Count	Minimum Count
545	2.706	1.014	7	1

6.7 Amendment Messages

This section corresponds to Section 3.3.7 of Reference[1]

Table 13: Statistics on Amendment Messages per Flight⁶

Flight Count	Average	Standard Deviation	Maximum Count	Minimum Count
486	2.457	1.727	14	1

⁵ Statistics on flights with interim altitude messages only

⁶ Statistics on flights with flight plan amendments only

6.8 Air Traffic Maneuvers

This section corresponds to Section 3.3.8 of Reference[1]. Detailed statistics on air traffic maneuvers are provided in Appendix C.

Table 14: Total Track Report Maneuver Count by Vertical and Horizontal Phase of Flight

Vertical Phase	Horizontal Phase of Flight		Total
	STR	TURN	
ASC	5083	1003	6086
DES	5336	1057	6393
LEV	1678	937	2615
Total	12097	2997	15094

Table 15: Percent breakdown of Flight Tracks by Vertical and Horizontal Phase

Vertical Phase	Horizontal Phase of Flight		Margin (%)
	STR (%)	TURN (%)	
ASC	33.676	6.645	40.321
DES	35.352	7.003	42.355
LEV	11.117	6.208	17.325
Margin (%)	80.144	19.856	100.000

7 Aircraft Distributions

This sections provides the metrics used to characterize the aircraft provided in the scenario. The selected metrics are aircraft type, model, navigational equipment, and the air carriers operating in the airspace. The section corresponds to Section 3.4 of Reference[1].

7.1 Aircraft Type

This section corresponds to Section 3.4.1 of Reference[1].

Table 16: Count by Aircraft Type

Aircraft Type	Count	Percentage of Total
J	625	73.964
P	64	7.574
T	143	16.923
Unknown	13	1.538
Total	845	100.000

7.2 Aircraft Models

This section corresponds to Section 3.4.2 of Reference[1]. A full listing and count of aircraft models is provided in Appendix D.

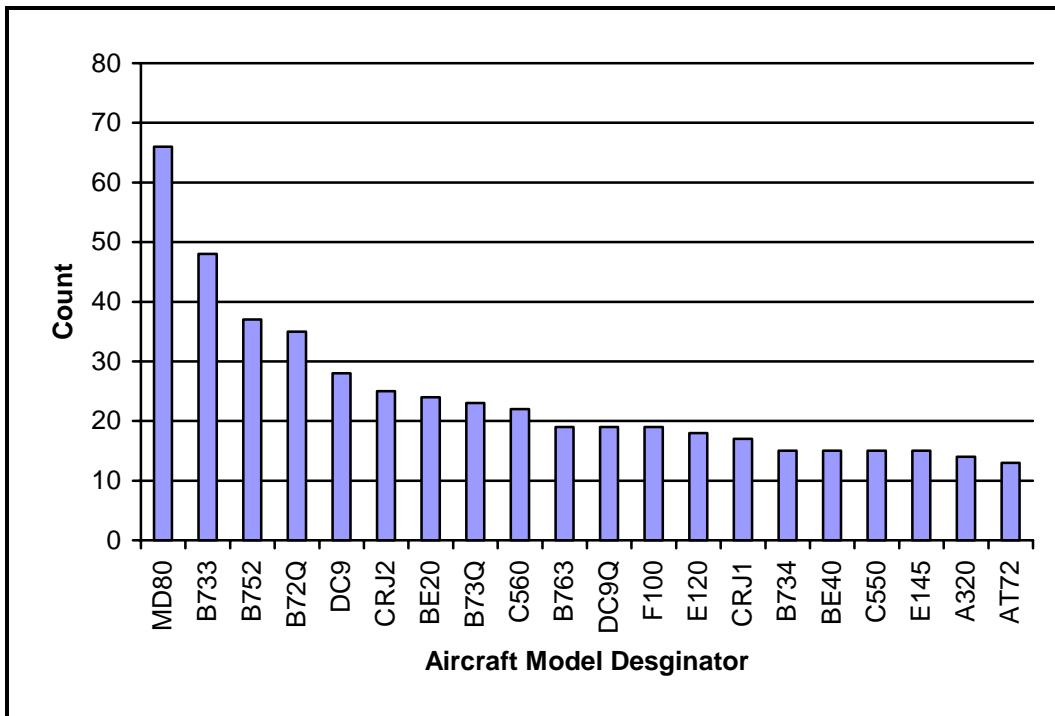


Figure 7: Count of Top Twenty Aircraft Models

7.3 Navigational Equipage

This section corresponds to Section 3.4.3 of Reference[1].

Table 17: Count by Aircraft Navigational Equipage Type

Nav. Equip. Designator	Count	Percentage of total
A	193	22.840
G	169	20.000
I	156	18.462
F	136	16.095
E	120	14.201
R	37	4.379
W	13	1.538
P	8	0.947
Q	7	0.828
Unknown	6	0.710
Total	845	100.000

7.4 Carrier Distribution

This section corresponds to Section 3.4.4 of Reference[1].

Table 18: Count by Carrier Type

Category	Count	Percentage of Total
Commercial	568	67.219
General Aviation	235	27.811
Other ⁷	42	4.970
Total	845	100.000

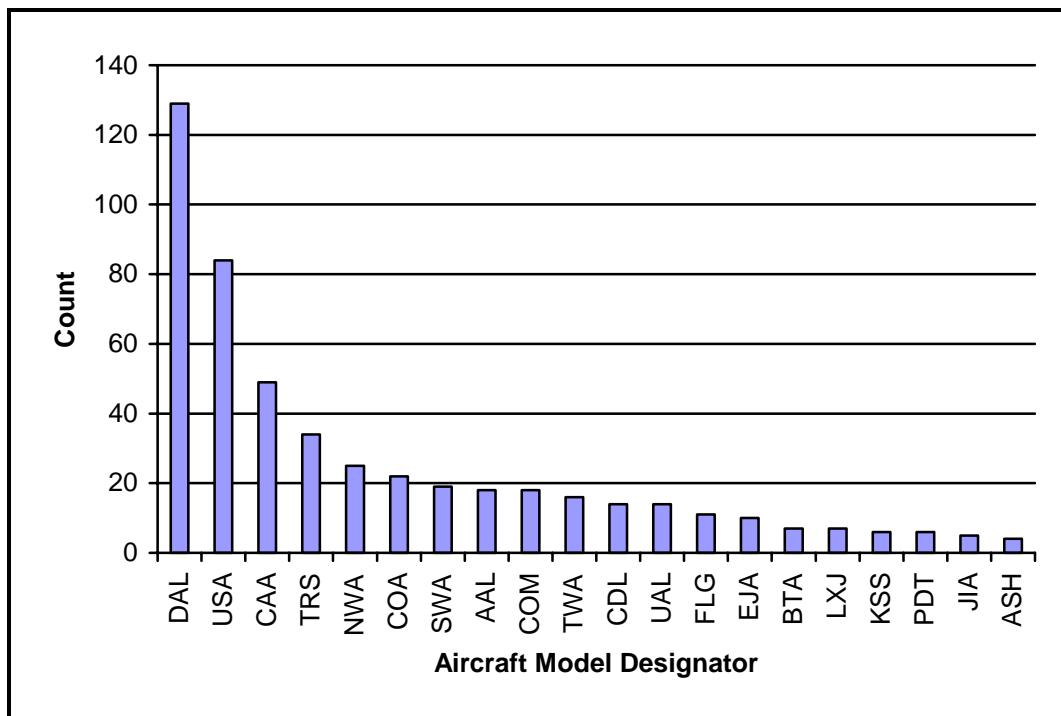


Figure 8: Count by Top Twenty Air Carriers

⁷ Includes military and aircraft with unrecognized designators

8 Flight Plan Adherence

This section provides statistics on lateral and vertical flight plan adherence and corresponds to Section 3.5 of Reference[1].

8.1 Lateral Flight Plan Adherence

This section corresponds to Section 3.5.1 of Reference[1].

Table 19: Statistics on Lateral Flight Plan Adherence by Altitude⁸

Upper Altitude (ft)	Flight Count	Max. Dist. Out (nm)	Min. Dist. Out (nm)	Average Dist. Out (nm)	Standard Dev.(nm)
10000	31	22.280	11.012	15.931	3.573
18000	9	27.779	13.069	19.341	3.361
33000	37	54.747	13.031	25.051	6.822
45000	23	41.632	14.264	25.026	5.110
Total	100				

8.2 Vertical Flight Plan Adherence

This section corresponds to Section 3.5.2 of Reference[1].

Table 20: Statistics on Vertical Flight Plan Adherence by Altitude⁹

Upper Altitude (ft)	Flight Count	Max. Dist. Out (ft)	Min. Dist. Out (ft)	Average Dist. Out (ft)	Standard Dev.(ft)
29000	369	35000	304	4864.058	4647.014
45000	150	15000	583	4165.926	2768.317
Total	519				

⁸ Statistics determined on tracks out of lateral adherence only.

⁹ Statistics were determined on tracks out of vertical adherence only.

Appendix A: Supplement to Section 6.1 - Aircraft Traffic Density

Table 21: Statistics on Aircraft Encounters by Altitude Interval for All Hours

Upper Altitude (ft)	Aircraft Count	Avg. Horz. Sep.(nm)	Standard Dev.(nm)
1000	0	0.000	0.000
2000	0	0.000	0.000
3000	0	0.000	0.000
4000	0	0.000	0.000
5000	0	0.000	0.000
6000	0	0.000	0.000
7000	7	19.148	10.725
8000	7	23.155	8.778
9000	0	0.000	0.000
10000	5	10.702	5.252
11000	16	17.768	7.795
12000	15	16.231	8.597
13000	22	19.227	9.413
14000	20	20.448	6.837
15000	94	15.759	8.187
16000	57	15.877	7.701
17000	66	18.377	6.905
18000	64	18.065	7.725
19000	30	17.462	8.067
20000	48	18.954	7.543
21000	75	17.537	7.143
22000	68	18.669	7.217
23000	59	18.716	8.055
24000	67	18.185	6.469
25000	64	16.872	7.632
26000	30	18.811	7.569
27000	51	18.544	7.723
28000	63	18.771	6.830
29000	91	18.324	7.294
31000	119	17.283	7.644
33000	260	16.302	8.252
35000	155	17.195	8.567
37000	86	16.276	8.304
39000	18	16.496	8.646
41000	10	17.540	6.863
43000	1	12.789	0.000
45000	0	0.000	0.000
Total	1668		

Appendix B: Supplement to Section 6.4 - Aircraft Ground Speed

Table 22: Statistics on Ground Speed by Altitude for All Hours

Upper Altitude (ft)	Distinct Aircraft	Average Speed (kts)	Standard Dev.(kts)
1000	2	140.818	9.304
2000	18	155.797	45.798
3000	63	209.324	53.279
4000	116	201.966	55.869
5000	175	211.587	53.353
6000	230	185.346	51.189
7000	269	183.409	53.448
8000	303	193.044	60.293
9000	354	214.246	59.300
10000	403	241.315	61.571
11000	462	273.921	60.274
12000	468	279.208	60.963
13000	463	285.007	72.220
14000	456	284.970	70.721
15000	462	276.165	76.825
16000	449	307.390	72.504
17000	436	296.252	78.794
18000	427	315.773	77.720
19000	413	305.347	78.996
20000	401	323.034	81.798
21000	394	336.881	79.282
22000	385	343.687	82.645
23000	375	370.564	80.219
24000	371	378.838	79.337
25000	353	372.835	83.581
26000	340	406.351	71.569
27000	336	392.716	87.660
28000	318	422.786	56.556
29000	297	453.941	49.390
31000	281	440.444	37.893
33000	262	452.684	42.731
35000	185	437.498	35.485
37000	129	461.494	41.347
39000	60	442.022	38.326
41000	33	460.064	43.034
43000	11	441.646	34.999
45000	2	416.118	5.404

Appendix C: Supplement to Section 6.8 - Air Traffic Maneuvers

Table 23: Count of Maneuvers by Altitude, Vertical and Horizontal Phase of Flight

Upper Altitude (ft)	Vertical Phase	Horizontal Phase of Flight	
		STR	TURN
1000	ASC	1	1
	DES	0	0
	LEV	0	1
2000	ASC	8	10
	DES	0	0
	LEV	10	14
3000	ASC	21	20
	DES	11	4
	LEV	32	34
4000	ASC	25	27
	DES	26	26
	LEV	69	50
5000	ASC	32	24
	DES	48	45
	LEV	94	61
6000	ASC	41	34
	DES	65	54
	LEV	116	63
7000	ASC	42	28
	DES	92	63
	LEV	143	55
8000	ASC	49	30
	DES	113	57
	LEV	166	50
9000	ASC	59	49
	DES	148	59
	LEV	177	78
10000	ASC	53	27
	DES	190	89
	LEV	203	72
11000	ASC	87	36
	DES	255	102
	LEV	215	66
12000	ASC	96	46
	DES	257	75
	LEV	224	59

13000	ASC	59	27
	DES	243	49
	LEV	232	44
14000	ASC	29	10
	DES	232	52
	LEV	232	24
15000	ASC	38	17
	DES	249	38
	LEV	231	27
16000	ASC	29	12
	DES	242	31
	LEV	223	23
17000	ASC	36	17
	DES	231	24
	LEV	216	19
18000	ASC	35	11
	DES	228	26
	LEV	209	23
19000	ASC	25	15
	DES	214	15
	LEV	209	21
20000	ASC	18	12
	DES	208	16
	LEV	202	16
21000	ASC	21	10
	DES	203	16
	LEV	201	16
22000	ASC	34	14
	DES	199	12
	LEV	195	15
23000	ASC	36	16
	DES	194	13
	LEV	187	21
24000	ASC	66	21
	DES	191	17
	LEV	193	22
25000	ASC	21	10
	DES	177	14
	LEV	184	17
26000	ASC	19	7
	DES	173	9

	LEV	177	20
27000	ASC	50	29
	DES	172	12
	LEV	183	29
28000	ASC	52	28
	DES	159	12
	LEV	170	17
29000	ASC	84	39
	DES	151	13
	LEV	156	11
31000	ASC	96	60
	DES	132	14
	LEV	145	28
33000	ASC	155	91
	DES	118	15
	LEV	140	27
35000	ASC	98	64
	DES	73	11
	LEV	89	12
37000	ASC	90	51
	DES	44	8
	LEV	71	13
39000	ASC	36	19
	DES	26	6
	LEV	26	6
41000	ASC	28	17
	DES	15	4
	LEV	11	2
43000	ASC	8	7
	DES	3	1
	LEV	4	1
45000	ASC	1	1
	DES	1	1
	LEV	1	0

Appendix D: Supplement to Section 7.2 - Aircraft Models

Table 24: Count and Percentage of Aircraft by Model Type

Model Type	Aircraft Count	Percent of Total
MD80	66	7.811
B733	48	5.680
B752	37	4.379
B72Q	35	4.142
DC9	28	3.314
CRJ2	25	2.959
BE20	24	2.840
B73Q	23	2.722
C560	22	2.604
B763	19	2.249
DC9Q	19	2.249
F100	19	2.249
E120	18	2.130
CRJ1	17	2.012
B734	15	1.775
BE40	15	1.775
C550	15	1.775
E145	15	1.775
A320	14	1.657
AT72	13	1.538
BE9L	11	1.302
DH8A	11	1.302
JS32	10	1.183
C130	9	1.065
SF34	9	1.065
B735	8	0.947
C650	8	0.947
A319	7	0.828
B712	7	0.828
B722	7	0.828
C750	7	0.828
GLF4	7	0.828
LJ31	7	0.828
LJ35	7	0.828
WW24	7	0.828
B762	6	0.710
BE58	6	0.710

H25B	6	0.710
PAY2	6	0.710
SBR1	6	0.710
B738	5	0.592
B772	5	0.592
C500	5	0.592
D328	5	0.592
FA20	5	0.592
L101	5	0.592
LJ25	5	0.592
LJ60	5	0.592
PA32	5	0.592
T38	5	0.592
BA46	4	0.473
BE10	4	0.473
BE36	4	0.473
C172	4	0.473
C182	4	0.473
C210	4	0.473
C414	4	0.473
CARJ	4	0.473
CL60	4	0.473
DC10	4	0.473
PA31	4	0.473
B350	3	0.355
B732	3	0.355
B737	3	0.355
B757	3	0.355
BE30	3	0.355
BE33	3	0.355
BE35	3	0.355
C310	3	0.355
C340	3	0.355
C441	3	0.355
GLF2	3	0.355
B703	2	0.237
C421	2	0.237
DH8B	2	0.237
F2TH	2	0.237
F900	2	0.237
H25C	2	0.237
M20P	2	0.237

MD11	2	0.237
AC11	1	0.118
AC90	1	0.118
AEST	1	0.118
ASTR	1	0.118
B1	1	0.118
B24R	1	0.118
B727	1	0.118
B742	1	0.118
B743	1	0.118
B764	1	0.118
BD9L	1	0.118
BE60	1	0.118
BE65	1	0.118
BE90	1	0.118
BE9T	1	0.118
C177	1	0.118
C2	1	0.118
C208	1	0.118
C425	1	0.118
C501	1	0.118
C525	1	0.118
C82R	1	0.118
C9	1	0.118
CL64	1	0.118
D382	1	0.118
DC87	1	0.118
DC8Q	1	0.118
E2C	1	0.118
F18	1	0.118
F28	1	0.118
FA10	1	0.118
FA50	1	0.118
GLF3	1	0.118
GLF5	1	0.118
H60	1	0.118
J328	1	0.118
JS41	1	0.118
K35R	1	0.118
LJ23	1	0.118
LJ24	1	0.118
LJ45	1	0.118

LJ55	1	0.118
LR24	1	0.118
LR31	1	0.118
LR55	1	0.118
LR60	1	0.118
MO20	1	0.118
MU30	1	0.118
P180	1	0.118
P28A	1	0.118
P28B	1	0.118
P28R	1	0.118
P32R	1	0.118
PA30	1	0.118
PA34	1	0.118
PAT2	1	0.118
PAY1	1	0.118
PAY3	1	0.118
PAZT	1	0.118
R135	1	0.118
T34T	1	0.118
T37	1	0.118
T45	1	0.118
	845	100.000